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Problem Solving and Concept Formation: Annotated Listing of National and International Curricular Projects at the Early Childhood Level.

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This document is an annotated listing of national and international curricular projects concerned with problem solving and concept formation at the early childhood level. It contains 50 citations. (WD)

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SOUTHWEST REGIONAL LABORATORY FOR EDUCATIONAL RESEARCH & DEVELOPMENT

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ANNOTATED LISTING OF NATIONAL AND INTERNATIONAL CURRICULAR PROJECTS AT THE EARLY CHILDHOOD LEVEL

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AAAS Commission on Science Education. J. R. Mayor and A. H. Livermore, Directors. American Association for the Advancement of Science, 1515 Massachusetts Avenue, Northwest, Washington, D. C. 20005.

The Commission is concerned with science education at all grade levels - kindergarten through college. It places particular emphasis on science education through the development of new programs for the training of teachers; and is interested in extending science education downward into the pre-kindergarten years, and improving the understanding of science through out-of-school activities.

Materials produced by the Commission consist of course material and guides for teachers, reprints of articles on the teaching of science, a newsletter, films demonstrating an exercise being taught, as well as a teacher training film and equipment kits for some of the exercises. Printed materials and kits of equipment and supplies are available from Xerox Corporation. Evaluation instruments are available with specific behavioral objectives identified.

African Primary Science Program. R. H. Robins, Director. Educational Services, Incorporated, 55 Chapel Street, Newton, Massachusetts 02158.

This is a research program designed to determine to what extent new ideas and methods for teaching science, particularly the so called "discovery" method developing in the United States, United Kingdom and elsewhere, are applicable in Africa. Materials for primary grade level in mimeographed form only. This is basically a research program. No formal evaluation at present.

Alberta Elementary Science Project. P. M. Purvis, Director, Department of Elementary Education, Faculty of Education, University of Alberta, Edmonton, Alberta, Canada.

The main objective of this project is to develop guidelines for science programs for elementary school children for the future.

Annotated Bibliography of Elementary School Science Experiemental Projects. J. R. Wailes, Director, Bureau of Educational Research, Hellems Annex 151, University of Colorado, Boulder, Colorado 80302.

Arlington County K-12 Curriculum Development Project. H. M. Wilson, Director. Associate Superintendent for Instruction, 4751 North 25th Street, Arlington, Virginia 22207.

The main objective is to relate science concepts with and to specific experiences, to provide extensive laboratory experiences by developing suitable activities and securing adequate equipment

and supplies, to develop a method of presentation which would be effective in teaching the so-called "slow learner" at all grade levels, to provide a wide variety of enrichment programs which would extend beyond the classroom, and to relate teacher preparation to all new phases of curriculum change. Materials available for all grade levels K-12. No evaluation instruments available at present.

Bureau of Public Schools-Peace Corps/Philippines Elementary Science and Mathematics Curriculum Development Project. A. Juele, Director. Science Education Section, Special Subjects and Services Division, Bureau of Public Schools, Manila, Philippines.

This project is an on-going program involving curriculum materials development, try-out, and revision. Original materials in the form of teaching guides are tried out for a school year, and revised according to findings from feedback reports.

Elementary Mathematics I-IV and Elementary Science 3 and 4 are now available, as well as evaluation instruments with behavioral objectives identified.

Cambridge Conference on School Mathematics. H. P. Bradley, Director. Educational Services Incorporated, 55 Chapel Street, Newton, Massachusetts 02158.

The program grew out of a conference in 1963 which explored curriculum reform needs in mathematics and is not engaged in the preparation of materials for classroom use. However, a continuing part of the program has been work with a limited number of schools, developing and trying out new mathematics curricula for elementary and secondary grades.

The behavioral objectives are identified as: The ability of young children to learn and understand modern mathematical concepts which in the past have been considered too advanced for them.

Center for Modernization of Mathematics and Physics Teaching. M. Valouch, Director, Professor of Physics, Faculty of Mathematics and Physics of the Carles University, Ke Karlovu 3, Praha 1, Czechoslovakia.

The major objective is to stimulate theoretical and experimental research concerning the social effectiveness of mathematics and physics in a highly developed society. A new conception of mathematics teaching in the fundamental nine-year school is being studied in several pilot classes using preliminary experimental

tests. The studies in physics begin with the fourth grade. No materials are available and the behavioral objectives are not yet identified.

Computer-based Mathematics Instruction at the Stanford Computer-based Laboratory for Learning and Teaching. P. Suppes, Director. Institute for Mathematical Studies in the Social Sciences, Ventura Hall, Stanford University, Stanford, California 94305.

An operational drill-and-practice program in elementary school mathematics and spelling in grades 1 - 6 is being developed. Technical reports are available. Standard achievement tests are used as evaluation instruments. The behavioral objectives are expressed in terms of rate of responding, rate of learning, and mean rate of errors. Structural variables in curriculum materials that are the main sources of learning difficulties are identified.

Conceptual Schemes in Science: A basis for Curriculum Development. Dr. C. R. Botticelli, Director, Boston University, 2 Cummington Street, Boston, Massachusetts 02215.

A more detailed interpretation of the conceptual schemes of science and the major items in the National Science Teachers Association publication, Theory Into Action in Science Curriculum Development, are being developed for kindergarten through twelfth grade.

Examples of ways in which pupil activities may be treated so as to make maximum contribution to a better understanding of conceptual schemes are provided. Teachers are assisted in designing curriculum materials and shown ways for using these materials in the classroom.

Conceptually Oriented Program in Elementary Science. (COPES). M. H. Shamos, Director. COPES Project, New York University, 4 Washington Place, New York, New York 10003.

The ultimate goal is to develop an understanding of the nature of matter at various levels of sophistication. Each concept will be presented in a structured learning sequence with the purpose of contributing to this understanding. A "spiral" system, in which the students begin from the most basic skills and concepts and follow the entire learning sequence as far as maturity and learning capacity permit, is being planned. A first draft of the Teachers' Manual for the conservation of energy has been produced but is not yet available. The evaluation of behavioral objectives has not been identified.

Conference of Science Education Study. (CSES) J. Isemura, Director. Institute for Protein Research, Osaka University, Osaka, Japan.

The principal objective is to improve and modernize education of both elementary and secondary school science. Materials written in Japanese are available.

Curriculum Development of Teaching Guides for Science. E. F. Carlson, Director. Associate Superintendent, Department of Curriculum Development and Teaching, 228 North LaSalle Street, Chicago, Illinois 60601.

The objectives include the development of a coordinated, sequential science program useful in understanding our natural environment, the development of skills of problem solving, and the development of the habit of scientific thinking. Curriculum guides for kindergarten through the eighth grade are available. The behavioral objectives are identified as accumulating information for a new evaluation cycle.

Elementary School Science Project, Utah State University (ESSP-USU). J. K. Wood, Director. Physics Department, Utah State University, Logan, Utah 84321.

The project aims to provide qualitative and quantitative experiments which can be understood by children from five to seven years, in terms of their experience, yet which use the methods and techniques of science. Emphasis is also placed on ways of solving interesting puzzles, thus leading to the introduction of scientific concepts. Published materials consist of a Teachers' Manual for first and second grades.

Elementary Science Advisory and Research Project. D. Hawkins, Director. Elementary Science Advisory Center, Ketchum 306W, University of Colorado, Boulder, Colorado 80302.

The purpose of this project is to explore new patterns for the elementary school science curriculum. The content and style of available science materials will be modified on the basis of observational research concerning children's learning behavior and strategy. A series of guides for elementary school teachers is in the process of publication. Behavioral objectives are identified, and the evaluation techniques include observation and participation by staff, preliminary to preparation of case-history material.

Elementary Science Project. J. C. Paige, Director. Departments of Education and Physics, Box 574, Howard University, Washington, D. C. 20001.

The several objectives of this project are (1) to develop a program of compensatory science experiences for disadvantaged children (K-6) and their parents; (2) to determine whether or not the participation in these experiences by disadvantaged children and their parents can help, in a significant way, to overcome social and personal handicaps which usually attend such privations; and (3) to discover what changes in behavior in both children and parents may result from participation in the project. Elementary science activity kits have been produced and may be available for sample distribution. Reprints of articles about the project in various newsletters and magazines are available free upon request. Evaluation instruments are not yet available.

Elementary Science Study (ESS). C. Walcott, Directoy. 55 Chapel Street, Newton, Massachusetts 02160.

The primary objective of this project is to develop more meaningful science materials for use by children. It is a highly individual experiment in which all children have access to the materials for open-ended rather than teacher or textbook directed investigations. Careful attention is given to all materials used so that all equipment looks like materials which are normally accessible to children in their own environment and not imposingly "scientific." A mixture of university scientists and master teachers work together to test and revise ideas berore the materials are released for general use in the schools.

The programs are designed for children from kindergarten to eighth grade level. Approximately 50 copies of each unit, together with the materials necessary to teach a class, are supplied free to schools selected for trial teaching.

Behavioral objectives are expressed in terms of increased involvement with science, improvement of problem-solving skills and ability to face a new set of materials, begin a scientific investigation, and predict what will happen under certain experimental conditions.

Elementary Science Textbook Editing Project. Choi Yung Bok, Director. Bureau of Textbooks, Ministry of Education, Seoul, Korea.

The purpose of this project is to edit the new Elementary Science Textbooks for grades 1 - 6 to conform to the curricular criteria which were established in 1963.

Greater Cleveland Mathematics Program of the Educational Research Council of Greater Cleveland (GCMP). G. S. Cunningham, Director. 446 Rockefeller Building, 614 West Superior Avenue, Cleveland, Ohio 44113.

The improvement of mathematical understanding and competency for all students is developed through an articulated and sequential program in mathematics for kindergarten through grade 12. The pupil is provided the opportunity and resources to think his way through mathematics and to see mathematics as a structured subject rather than isolated bits of information to be memorized. Worksheets and teachers' guides as well as other publications may be purchased from Science Research Associates, Incorporated, 259 East Erie Street, Chicago, Illinois 60611 and Educational Research Council, 614 West Superior Avenue, Cleveland, Ohio 44113. The behavioral objectives are identified as student awareness of mathematical structure.

Individual Mathematics Programme. M. L. Clark, Assistant to the Director. Australian Council for Educational Research, 9 Frederick Street, Hawthorn East 2, Victoria, Australia.

Texts and assignment materials to permit individual progress through a modern mathematics program have been developed for grades 3 and 4. Project evaluation indicates that while students using Set B made similar gains in learning as students in control classes, they showed greater interest in mathematics and indicated a preference for more varied approaches to mathematics problems.

Individually Prescribed Mathematics Instruction (IPI MATH). J. Bolvin, Director. Learning Research and Development Center, 160 North Craig Street, University of Pittsburgh, Pittsburgh, Pennsylvania 05213.

A set of 400 performance objectives for kindergarten through sixth grade are formulated. These are embedded in pre- and post-tests, and curriculum tests used to assure mastery and to identify what the study sequence should be. Worksheets are available for purchase but can be obtained only with the approval of the director. Evaluation instruments, with the behavioral objectives identified, are available.

K-12 Science Design. J. Taylor, Director. Elementary Curriculum Coordinator, Las Cruces School District No. 2, 301 West Amador Avenue, Las Cruces, New Mexico 88001.

The purpose of this project is to study curricula in science and develop a design which would meet the needs of the Las Cruces

School District No. 2 for grades 1 - 12. Materials in the form of resource units may be purchased from the School District. Evaluation instruments not yet available.

Longitudinal Study of the Effectiveness of Children's Experimentation and Learning of Selected Physics Principles. A. M. Lahti, Professor of Physics, West Washington State College, Bellingham, Washington 98225.

Children in grades 1 - 6 are designing and conducting their own experiments and drawing conclusions from them. Fifteen teachers are participating in the study. No materials are available at the present time.

Madison Project of Syracuse University and Webster College. R. B. Davis, Director. 8356 Big Bend Boulevard, St. Louis, Missouri 63119.

The purpose of this project is to develop, disseminate, and implement a supplementary program in mathematics for nursery school through grade 12. For the last two years, special emphasis has been placed upon "mathematics laboratories" and the use of physical materials; this has often involved close cooperation with the Elementary School Science (ESS) Project of ESI, and with the Nuffield Mathematics Project in England. Several types of material are available at no cost. Other publications may be purchased from Addison-Wesley Publishing Company, Incorporated, Reading, Massachusetts. Explicit definition of behavioral objectives is provided. The appropriate function of evaluation is seen as the description of the activities provided, with occasional investigations of the underlying assumptions of the program. Thus the criteria for evaluation are necessarily subjective.

Massachusetts Department of Education K-12 Resource Guide. J. W. Packard, Director. 200 Newbury Street, Boston, Massachusetts 02116.

The classroom teacher is assisted in identifying and relating recent advances in aerospace science and technology to subject matter areas.

Michigan Science Curriculum Committee (MSCC-JHSP). W. C. Van Deventer, Director. Department of Biology, Western Michigan University, Kalamazoo, Michigan 49001.

Open-ended laboratory experiences directed toward interdisciplinary ideas in general science at the seventh grade level are developed and tested. Some of the materials have been used successfully at the sixth and eighth grade levels. All of the materials produced

are available at no cost from Dr. W. C. Van Deventer at Project Headquarters.

Behavioral objectives are described as the demonstration of understanding of the ideas toward which the laboratory experiences are directed. The questions asked by students are believed to give a better indication of the extent and quality of their thinking than the answers they might give to questions asked of them.

Minnesota Mathematics and Science Teaching Project (MINNEMAST). H. Werntz, Jr., Director. 720 Washington Avenue, Southeast, Minneapolis, Minnesota 55414.

Coordinated mathematics and materials for grades K-6, for children and teachers, are being prepared.

Classroom materials are being tried out in approximately 200 classrooms under the supervision of 10 cooperating colleges. Written comments about the clarity of the background material, ease of using the lessons, and observations of the children's reactions are obtained from the teachers. Achievement tests based on revision of items constructed last year have been developed for kindergarten and first grade. Evaluation of in-service mathematics and science materials is being conducted. Changes in subject matter performance and attitudes toward mathematics and science are being measured.

National Science Foundation. Science Curriculum Improvements Program, Undergraduate Education in Science, National Science Foundation, Washington D.C. 20550.

The Superintendent of Documents, U.S. Government Printing Office, has issued a publication titled Course and Curriculum Improvement Projects, which describes the mathematics, science, and engineering projects supported by the Science Course Improvement Programs of the Foundation.

New Science Curriculum Study Project. Chung Yun Tai, Director. College of Education, Seoul National University, Seoul, Korea.

New science curricula such as PSSC, CHEMS, BSCS, ESCP, SMSG, and IPS are being studied, preparatory to translation and adaptation for the new curricula to the Korean situation. Science teachers will be trained in the methods of the new curricula.

Nordic Committee for the Modernizing of School Mathematics. L. Sandgren, Director. Ecklesiastikdepartementets Kommittelokaler, Fack, Stockholm 5, Sweden.

This is a new approach to mathematics at all grade levels; obsolete subjects are being deleted, and concept formation, sets, elementary logic, functions, vectors, and basic laws of arithmetic are emphasized. Materials for grades 1 - 12 are being taught on an experimental basis. Teachers report their experiences in annecdotal descriptions. Some short tests on the common elements in both the experimental and traditional program have been designed.

Nuffield Junior Science Teaching Project. E. R. Wastnedge, Director. Mary Ward House, 5-7 Tavistock Place, London, W.C. 1, England.

Help and guidance are provided for those who wish to use science in the education of children 5 to 13 years. Very little information is available at present.

Nuffield Mathematics Teaching Project. G. Matthews, Director. 12 Upper Belgrave Street, London S.W. 1, England.

A contemporary approach to mathematics for children from 5 to 13, this is the first such project for this age-range in Great Britain. Materials are prepared for teachers rather than the children. In-service training is provided at 91 Teachers' Centers.

Project evaluation is obtained via reports, questionnaires and personal liaison, leading to revision of materials. "Checkups" on the progress of individual children are being prepared by a team from the Institut des Sciences de l'Education, Geneva, who will also later obtain statistical evidence.

Oakleaf Individualized Elementary School Science. J. Volvin, Director. Learning Research and Development Center, 160 North Craig Street, University of Pittsburgh, Pittsburgh, Pennsylvania 15213.

Objectives for the student (K-6) are stated in terms of expected student performance in a laboratory setting. Lessons involve individual kits of materials, tape cartridges, and response booklets. Diagnostic tests with objects are used to find out what the student can or cannot do. Evaluation instruments are listed and behavioral objectives identified.

OPI Mathematical Reform Project. T. Varga, Principal Originator. National Institute of Pedagogy, Chair of Mathematics, Budapest VII, Gorkij fasor 17-21, Hungary.

The objective of this project is to develop a mathematical curriculum for mass education as well as one for gifted pupils. Both are for grade levels K through 12. Materials, consisting of worksheets and instructions for teachers, are not yet available. Preliminary versions of worksheets are sometimes tested with a small sample of pupils before presenting them to a whole class.

Patterns in Arithmetic. H. Van Engen, Director. Research and Development Center for Learning and Re-education. 1404 Regent Street, Madison, Wisconsin 53706.

The basic objective of teacher training is implemented by a self-contained program designed to be used by children in grades 1 through 4. The teacher-training aspect comes via telecasts and teacher commentaries. Evaluation instruments are listed and behavioral objectives identified.

Pennsylvania Retrieval of Information in Mathematics Education System (PRIMES). Emanuel Berger, Bureau of Research Administration and Coordination, D. E. Creswell, Bureau of General and Academic Education, Department of Public Instruction, Box 911, Harrisburg, Pennsylvania 17126.

The purpose of this project is to assist local school districts in making decisions about selecting a mathematics program. The system will contain a comprehensive library of published textual materials that have been analyzed in detail.

Pennsylvania Science in Action Program. I. T. Edgar, Director. Science Education Advisor, Department of Public Instruction, Bureau of General and Academic Education, Box 911, Harrisburg, Pennsylvania 17126.

Local schools are being given direction and assistance in establishing laboratory science learning activities and preparing materials for local school curricula and teacher in-service use. Resource teachers are trained to take on the job of developing and implementing in-service programs for their own school systems.

Ponce Curriculum Center. J. S. Oliver, Director. Box 1125, Ponce, Puerto Rico, 00732.

The purpose of this project is to produce curriculum materials

in science, mathematics and Spanish; to provide materials for in-service training for teachers in the new programs of science and mathematics; and to carry out in-service training for resident teachers so as to prepare them to work as coordinators.

Project Mathematique de Sherbrooke, Universite de Sherbrooke. Z. P. Dienes, Director. 1382 Rue Dominion, Sherbrooke, Quebec, Canada.

The eventual revision of mathematics is the objective of this project. A general province-wide revision, in the light of the most modern available knowledge, has been prepared by the Quebec Government for children from 6 to 9 years. Behavioral objectives identified are the recognition of abstract mathematical structures in real situations; ability to recognize a structure embedded isomorphically in another; ability to generalize a structure, and greater ease of learning when new subjects are introduced.

Reorganized Science Curriculum, Kindergarten through Grade 12 of the Minneapolis Public Schools. J. H. Shutts, Director. 807 Northeast, Broadway, Minneapolis, Minnesota 55413.

Reorganization of the former science curriculum into an integrated science curriculum, from kindergarten through grade twelve, with classroom teacher resource materials and evaluative tools, is under way. A few behavioral objectives are identified.

School Mathematics Study Group (SMSG). E. G. Begle, Director. School Mathematics Study Group, Cedar Hall, Stanford University, Stanford, California 94305.

The primary purpose of the SMSG is to foster research and development in the teaching of school mathematics. The major emphasis of SMSG is on the development of courses, teaching materials, and teaching methods. It is a part of SMSG's task, in cooperation with other mathematical organizations, to encourage exploration of the hypotheses underlying mathematics education for kindergarten through twelfth grades. Behavioral objectives are identified as solving specially selected mathematical problems.

Science Curriculum Improvement Study (SCIS). R. Karplus, Director. Science Curriculum Improvement Study, Physics Department, University of California, Berkeley, California 94720.

SCIS is aimed at the development of scientific literacy, by which is meant a sufficient knowledge and understanding of the fundamental concepts of both the biological and physical sciences for effective

participation in twentieth-century life. It attempts to develop a free and inquisitive attitude and the use of rational procedures for decision making.

For the SCIS "materials-centered" approach, the elementary classroom becomes an actual laboratory.

SCIS evaluation is in terms of "feedback", since the project does not presume to provide a definitive and absolute measurement of the scientific literacy of the pupils who complete the program. Instead, they are concerned with assessing the impact of SCIS in such a way that teachers and curriculum designers can choose better strategies for teaching.

Science Teaching Center, University of the Philippines. D. F. Hernandez, Director. Science Teaching Center, University of the Philippines Diliman, Quezon City, Philippines.

The purpose of this project is to prepare curriculum materials in mathematics and science for elementary and secondary schools. Imaginative inquiry and skills for independent learning are emphasized, rather than dogmatic assertion and memorization of facts.

Behavioral objectives in elementary science are identified.

Southern Illinois University Comprehensive School Mathematics Project. B. Kaufman, Director. SIU-CSMP, University School, Southern Illinois University, Carbondale, Illinois 62901.

Based on the spirit of the Cambridge Conference report, "Goals for School Mathematics," this totally individualized mathematics curriculum for grades K-12 will utilize modern technology to its fullest potential. It is expected that this project will create, design and build a model school of the future to house such a curriculum. The chief difference between this and other projects is that it stresses the substantive or subject matter aspects of education. For this reason, professional mathematics will play a major and indispensable role. No evaluation design or materials are available as yet.

Stanford-Brentwood Computer-Assisted Instruction. P. Suppes and R. C. Atkinson, Directors. Institute for Mathematical Studies in the Social Sciences, Ventura Hall, Stanford University, Stanford, California 94305.

A full tutorial program in individualized primary-school mathematics and reading for computer presentation is now under way. Achievement

of behavioral objectives as evaluated in terms of mean rate of responding and mean rate of errors. Attempts will be made to identify sources of learning difficulties in the curriculum materials.

Structural Material for Teaching Mathematics to Infants. S. A. Shah, Director. Institute of Education, University of the West Indies, St. Augustine, Trinidad, West Indies.

The objective is to introduce content in mathematics so that there is continuity from Infant School through High School. Teachers will be instructed in psychological principles for teaching mathematics, including Piaget's principles of conservation and reversibility, and Wertheimer's idea of structural thinking.

Behavioral objectives are identified as problem solving for developing the child's ability to apply available mechanical skills to the solution of problems. At the teacher training level, changes in the attitude of the teachers will be effected.

Study of a Quantitative Approach in Elementary School Science. E. Swartz, Director. Physics Department, State University of New York, Stony Brook, New York.

Natural science lessons involving measurement and quantitative analysis are being prepared for grades 1-6.

A statement of guidelines and a sampler containing lessons at four grade levels are now available.

During the trial year, teachers were asked to fill out report forms for each lesson. The complete account and analysis of these forms has been filed with the National Science Foundation and provides an evaluation of the program.

Survey of Recent East European Literature in School and College Mathematics. A. L. Putnam, Director. Department of Mathematics, Eckhart Hall 411, University of Chicago, Chicago, Illinois 60637.

Principal aims of the Survey are to develop an extensive information program on current Soviet and other East European mathematics from kindergarten through college level and to make available from these sources mathematical materials for teachers and students in American schools and colleges.

Teacher's Automated Guide (TAG). G. S. Ingebo, Director. Educational Research and Testing, Portland Public Schools, 631 Northeast Clackamas Street, Portland, Oregon 97208.

The objective of this project is to develop an automated, self-renewing teachers' guide wherby individual pupil data and curriculum alternatives for grades K-14 are made accessible to teachers through a computer system. Essential features of the program include ready access to background data on students and their readiness to learn, a wide variety of curriculum activities in AAAS format, and a provision for feedback of both pupil and curriculum information to make the system self-correcting and increasingly useful as a professional tool for the teacher.

University of Illinois Arithmetic Project (UIAP). D. A. Page, Director. 372 Main Street, Watertown, Massachusetts 02172.

The study of mathematics is conceived as an adventure requiring and deserving hard work. Materials for grades K-6 are being developed, although a systematic curriculum is not considered possible until more alternatives have been explored. Frameworks that provided day-to-day, "here-is-something-to-try" ideas for the classroom are needed. Teachers beginning an institute are encouraged to start topics with their classes within a few weeks.